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Can children with developmental language disorder explain actions in terms of intentions?

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Author notes

All authors were employed by the University of Edinburgh while conducting the research reported in this paper. Jennifer Reid is currently Honorary Consultant Speech and Language Therapist with NHS Fife. Claire Murray is currently Director of Emotion Works CIC.

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Abstract

This study aimed to establish whether 5- to 7-year-old children with developmental language disorder (DLD) have difficulties explaining actions in terms of intentions and if so, to elucidate the nature of such difficulties. Children with DLD and typically developing chronological age peers (TD group) participated in a production task designed to elicit “intentional mode” explanations (e.g. *The girl put a spider in the bed because she wanted to give the boy a fright*). The DLD group produced significantly fewer well-formed intentional mode explanations than the TD group, made significantly fewer attempts at producing these explanations, and used a more restricted range of linguistic constructions. However, almost all the children with DLD made at least occasional attempts at producing intentional mode explanations. These findings imply that although children with DLD are likely to require support with the socially important task of explaining actions in terms of intentions, there is a foundation on which intervention and classroom practice can build.

Keywords

Children with developmental language disorder, explanation, intentions, complex sentences, causal connectives

Introduction

Explanations play a central role both in formal education and in social interactions. They can be used to share understanding with other people about the causal links that help to make sequences of actions or events meaningful and coherent. Participating in conversations about why actions and events have occurred is likely to provide children with opportunities not only to develop their understanding of how things “work” in their social and physical

environments, but also to demonstrate that they have this understanding, particularly in classroom contexts.

In this paper, we ask whether and how the ability to explain actions differs between children with developmental language disorder (DLD) and children with typical development (TD). Our choice of the term “developmental language disorder (DLD)” is based on the recent recommendation from a Delphi consensus study that this term should be used to refer to difficulties with spoken language that are not associated with known biomedical conditions in which language disorder occurs as part of a more complex pattern of impairments, such as autism spectrum disorder or brain injury, in preference to such terms as “specific language impairment (SLI)” (Bishop, Snowling, Thompson, Greenhalgh, & CATALISE-2 consortium, 2017).

Since intentions are integral to human action, explanations of why someone has carried out a particular action often refer to their intention to achieve a particular outcome (e.g. *The girl put a spider in the bed because she wanted the boy to get a fright*). Donaldson (1986) refers to these explanations as intentional mode explanations and distinguishes them from empirical mode explanations, in which an event/state is explained in terms of a prior event/state (e.g. *The girl fell off her bike because she hit a stone*). She found that 5-year-old children with typical language development coped fairly well with producing well-formed intentional mode explanations in an elicited production task.

In a previous paper, we reported that 5- to 7-year-old children with DLD have difficulties with producing empirical mode explanations (Donaldson, Reid, & Murray, 2007). However, as far as we are aware, nothing is known about whether children with DLD are able to explain human actions in terms of intentions, i.e. to produce intentional mode explanations. The current paper aims to provide a more complete picture of children with DLD’s explanatory abilities by addressing the question of whether they have difficulties in producing

intentional mode explanations, and if so, by elucidating the nature of these difficulties, as well as any strengths.

There are several reasons why being able to handle intentional mode explanations is likely to be highly relevant to children's ability to access the curriculum effectively, as well as to their social skills. Explanations of actions are central to narratives and conversational interactions, both of which play key roles in the development of children's language and literacy skills (e.g. Griffin, Hemphill, Camp, & Wolf, 2004; Wellman et al., 2011).

Explanations of actions also figure prominently in the expressive arts and social subjects, as well as being integral to the development of social and emotional understanding. Explanatory discourse about human action is a powerful social tool that can be used to explore the reasons for one's own and others' actions, to share one's understanding of these reasons with others, and to influence each other's actions, attitudes and emotional responses in subsequent interactions. Therefore, children's ability to handle intentional mode explanations could have significant implications for the selection of appropriate approaches to behaviour management and guidance.

Intentional mode explanations – a linguistic and socio-cognitive framework

Producing explanations of actions involves both linguistic and socio-cognitive skills, and there is likely to be a complex interplay between these two types of skills. The main focus of the study reported here is on the extent to which 5- to 7-year-old children with DLD possess and deploy the linguistic tools required to produce intentional mode explanations. In addition, though, we will keep in mind the possibility that using these linguistic tools may partly reflect and/or contribute to socio-cognitive difficulties. In this section, we outline a framework for conceptualising the linguistic and socio-cognitive demands involved in producing explanations of actions (based on Donaldson, 1986).

The following example makes explicit all the key components in an intentional mode

explanation:

- (1) *The girl put a spider in the bed because she wanted to give the boy a fright and she believed that putting a spider in his bed would make him get a fright.*

As this example illustrates, the causal sequence that underpins an intentional mode explanation consists of three main components:

- An **action** (e.g. the girl putting a spider in the bed)
- A **reason** for the action, which corresponds to the agent's intention to achieve a particular outcome (e.g. the girl's intention to give the boy a fright)
- An **outcome** of the action (e.g. the boy getting a fright).

The agent's intention can be analysed further as consisting of a desire component and a belief component (Searle, 1981). Thus, in giving an intentional mode explanation, the speaker is asserting that an action is caused by the agent's desire to achieve a particular outcome (e.g. the girl wants the boy to get a fright) combined with their belief that the action will cause the outcome (e.g. the girl believes that putting a spider in the boy's bed will give him a fright).

Rather than producing a fully specified intentional mode explanation as in example (1), speakers are more likely to use one of the three main types of intentional mode construction illustrated by the following examples:

- (2) *The girl put a spider in the bed because she wanted to give the boy a fright.*
- (3) *The girl put a spider in the bed so (that) the boy would get a fright.*
- (4) *The girl put a spider in the bed to give the boy a fright.*

As described in Table 1, these three types of construction differ both in terms of the particular part of a fully specified intentional mode explanation that they emphasise and in terms of their linguistic structure. Like the constructions that are used in producing empirical mode explanations, these constructions involve complex syntax, i.e. sentences containing two or

more verbs and clauses. In addition, though, the intentional mode constructions involve a further level of complexity in that they include complement clauses or modal verbs. In intentional explanations, the verb that refers to the intended outcome always occurs in its non-finite form (e.g. *get*), whereas empirical explanations refer to the outcome with a finite verb-form (e.g. *got*). This reflects the fact that while empirical explanations refer to events that have actually happened, intentional explanations have a hypothetical, forward-looking quality in that they refer to an anticipated outcome.

Table 1 about here

In providing a conceptual account of the characteristics of well-formed intentional mode explanations, it is necessary to take account of the distinction not only between intentional and empirical explanations, but also between *because* and *so* constructions. Furthermore, these two distinctions interact, as shown in Table 2. In the intentional mode, either *because* or *so* can be used to introduce a reason for an action. However, *because* needs to be followed by a phrase referring to the agent's desire or goal (e.g. *wanted to*, *was going to*), whereas *so* needs to be followed by a construction that contains a modal auxiliary (e.g. *would*, *could*) and refers to the predicted outcome of the action. This contrasts with the empirical mode, where *because* introduces a reason/cause but *so* introduces an outcome/effect. Also, *so* serves different functions in these two modes, being used in the sense of "in order that" in the intentional mode but in the sense of "therefore" in the empirical mode.

Table 2 about here

In summary, producing intentional mode explanations requires the use of some specific linguistic tools which signal that the causal relationship being referred to is between an action and an **intention** to bring about an outcome, rather than between an action and an

actual outcome. This, in turn, suggests that producing intentional mode explanations is demanding not only linguistically but also from a socio-cognitive perspective.

The production of intentional mode explanations requires theory of mind abilities in that it involves reasoning about mental states (intentions, beliefs and desires) as causes of actions. In addition, it involves reasoning about two types of causal relationship:

- between the action and the reason/intention (e.g. the girl putting a spider in the bed because she is intending to give the boy a fright)
- between the action and the outcome (e.g. the girl putting a spider in the bed causing the boy to get a fright).

These two types of causal relationship are interdependent since the agent's intention includes their belief about the likely outcome of their action. Also, since other people's intentions are not directly observable, they often need to be inferred from observing sequences of actions and outcomes. At the same time, though, children need to be able to distinguish between these two types of causal relationship. This involves distinguishing between predicted outcomes (e.g. believing that the boy will get a fright) and outcomes that have actually happened (e.g. the boy got a fright). Thus, as in more traditional forms of theory of mind tasks such as false-belief tasks (Wimmer & Perner, 1983), cognitive flexibility is required in order to reason about relationships between mental representations of possible states of the world and actual states or events.

Why might children with developmental language disorder have difficulties explaining actions in terms of intentions?

In a previously reported study, conducted on the same children as participated in the present study, we found that 5- to 7-year-olds with DLD were less likely than their typically developing peers to produce well-formed explanations of events (Donaldson et al., 2007). On the other hand, all the children with DLD made at least some use of causal connectives, and

the two groups used causal connectives with the same overall frequency. The current study extends this work by investigating whether a similar pattern of strengths and weaknesses emerges when children with DLD are asked to produce explanations of actions. While we are not aware of any studies that have directly investigated children with DLD's production of intentional mode explanations, there is some evidence from research on related aspects of their language production which suggests that they will be likely to encounter difficulties with intentional mode explanations.

Producing explanations, in either the intentional or the empirical mode, typically involves using complex syntax (i.e. sentences of more than one clause). Our previous finding that school-age children with DLD have difficulties producing empirical mode explanations is consistent with other evidence that the production of complex syntax is difficult for these children (e.g. Eisenberg, 2003, 2004; Gillam & Johnston, 1992; Leonard, 1995; Marinellie, 2004; Owen, 2010; Owen & Leonard, 2006; Owen van Horne & Lin, 2011; Schuele & Dykes, 2005). The difficulties with production of complex syntax that have been reported for children with DLD take a variety of forms, relating both to the frequency and to the accuracy of complex sentence production. For example, children with DLD have been found to produce two-clause sentences, such as those involving coordinate, relative or adverbial clauses, less frequently than TD children (Marinellie, 2004) and also to continue making tense morphology errors in complex sentences until an older age than they do for simple sentences (Owen, 2010).

In addition to involving the production of complex sentences and causal connectives, intentional mode explanations also involve producing cognitive state verbs (*want/going to* in *because* constructions), non-finite complement clauses (in *because* and *to* constructions) and modal auxiliary verbs (*would/could* in *so* constructions), all of which could pose challenges for children with DLD. Furthermore, intentional mode *because* constructions involve

“combined syntax” in that one of the clauses in a sentence that is already complex subsumes an additional clause (e.g. *to give the boy a fright*), giving three clauses in total.

Complex sentences that involve combined syntax are produced less frequently by children with DLD than by children with typical language development (Marinellie, 2004), so it is likely that children with DLD will have difficulties producing intentional mode *because* + *want/going to* constructions. It is less clear whether difficulties with producing cognitive state verbs will also impact on 5- to 7-year-old children with DLD’s production of intentional mode explanations. Although preschool children with DLD use cognitive state verbs (e.g. *think, believe*) less frequently than typically developing children (Johnston, Miller, & Tallal, 2001) and although difficulties in using cognitive state verbs and complement clauses persist for 5- to 8-year-old children with DLD, the older children’s difficulties are subtle and tend not to affect high frequency verbs such as *want* and *go* (Eisenberg, 2003; Owen van Horne & Lin, 2011). However, this evidence is based mainly on two-clause sentences rather than on three-clause combined syntax sentences as used in intentional mode constructions.

There is some evidence that children with DLD have difficulties in producing non-finite complement clauses and that they are more likely than TD children to omit the particle *to* from these clauses (Johnston & Kamhi, 1984; Leonard, Eyer, Bedore, & Grela, 1997; Owen & Leonard, 2006), although other studies have found such omissions to be rare for children with DLD (Eisenberg 2003, 2004). All these studies relate to non-finite clauses that function as the object complement of a verb, as in the types of clauses that follow *because* in intentional mode explanations (e.g. *She wanted to give the boy a fright*). Non-finite clauses also feature in intentional mode *to* constructions, where they function as adverbial clauses of reason that modify the main clause directly (e.g. *She put a spider in the bed to give the boy a fright*). As far as we are aware, our study is the first to investigate children with DLD’s production of this construction type.

To produce well-formed intentional mode *so* constructions, children need to be able to use modal auxiliary verbs (e.g. *will/would*, *can/could*). *Can* is reported to be the earliest emerging and most frequently used modal verb, both for typically developing children (Richards, 1990) and for children with DLD (Leonard, 1995). Leonard and colleagues (Leonard et al., 2003; Leonard, Deevy, Wong, Stokes, & Fletcher, 2007) found that while most 4- to 6-year-olds with DLD used *can* in semantically appropriate ways and at a comparable frequency to typically developing children, a small minority did not, and a larger number had difficulties in using the past tense form *could*, tending either to substitute *can* or to omit the modal auxiliary. There appears to be no research looking specifically at the production of *will/would* by children with DLD, but since even the earlier emerging *can/could* is sometimes problematic, it seems likely that *would* constructions will also be difficult to produce for at least some children with DLD.

Is it likely that children with developmental language disorder will attempt to explain actions in terms of intentions?

Tomasello, Carpenter, Call, Behne, and Moll (2005) argue that humans have a unique ability to use shared goals and intentions as a basis for collaborating with others, and that the foundations of this shared intentionality are evident even during infancy. They regard the development of shared intentionality as involving an interaction between two strands – an understanding of intentions and a motivation to share psychological states with other people. This implies that children will be strongly motivated to explain people's actions in terms of psychological states such as intentions. Against this backdrop, we regard intentional mode explanations as a powerful linguistic tool for sharing intentionality in ways that extend beyond the immediate context of non-verbal interactions.

Children with DLD do not (by definition) have such severe impairments in social understanding as children with autism. Therefore, given the salience of shared intentionality

in early development, it might be expected that children with DLD, like typically developing children, will be strongly motivated to explain actions in terms of intentions and will attempt to produce such explanations even though their attempts might not always be linguistically well-formed. On the other hand, there is also evidence suggesting that children with DLD sometimes show subtle deficits in socio-cognitive understanding on a variety of theory of mind tasks (e.g. Farrant, Fletcher, & Maybery, 2006). It is possible, therefore, that their production of intentional mode explanations will be affected by limitations not only in their linguistic abilities but also in their socio-cognitive understanding.

Research on typically developing children's socio-cognitive development has implications regarding the types of intentional mode constructions that children will be most likely to use. Early concepts of intention seem to be more closely linked to desire concepts than to belief concepts (Joseph & Tager-Flusberg, 1999; Liao, Li, & Deák, 2011; Schult, 2002). Similarly, children are able to mentally represent and talk about desires before beliefs (e.g. Astington & Gopnik, 1991; Bartsch & Wellman, 1995; Wellman, 2012; Wellman & Liu, 2004; Woolley & Wellman, 1990). This suggests that when explaining actions in terms of intentions, children will be more likely to use linguistic constructions that emphasise desires (i.e. *because...wanted to* constructions) rather than those that emphasise beliefs or predicted outcomes (i.e. *so... would/could* constructions).

The current study

The main aim of our study was to assess whether the linguistic skills required to explain actions in terms of intentions represent a source of difficulty for 5- to 7-year-old children with developmental language disorder and if so, what the nature and extent of these difficulties are, in comparison to a group of typically developing children of the same age. The study forms part of a larger-scale project designed to investigate the ability of children with DLD to explain and to understand causal relationships across a range of structured tasks and in classroom discourse.

Ultimately, we aim to use our findings to inform the development of resource materials for improving explanatory skills in the context of everyday classroom activities.

We used an elicited production paradigm that encouraged children to talk about picture cards depicting action-outcome sequences, in the context of a game in which the child and the researcher took turns at talking. The child was asked to answer causal questions, complete causal sentences initiated by the researcher, imitate causal sentences produced by the researcher, and produce full causal sentences. These different item types vary in the extent to which they encourage particular construction types to be used. This was useful in investigating whether the DLD and TD groups differed in the types of linguistic constructions they used in intentional mode explanations, and also in giving the children a variety of different types of opportunity to produce intentional mode explanations within a structured task.

The performance of the two groups was compared with respect to three questions, focusing on different aspects of their performance:

- (i) Did the DLD group produce fewer correct intentional mode explanations than the TD group?
- (ii) Did the DLD group make fewer attempts at producing intentional mode explanations than the TD group?
- (iii) Did the DLD and TD groups differ in the types of linguistic construction they used when producing intentional mode explanations?

Due to the complexity of the linguistic demands involved in producing intentional mode explanations, we expected that the DLD group would produce fewer **correct** intentional mode explanations than the TD group. It was not clear, though, whether the DLD group would be less likely than the TD group to **attempt** to produce intentional mode explanations since previous research gives rise to conflicting predictions. On the one hand, the salience of intentions in young children's communication and thinking, combined with the absence of

gross social deficits in children with developmental language disorder, suggests that the DLD group might be just as likely as the TD group to attempt to explain actions in terms of intentions. On the other hand, the evidence regarding children with DLD having subtle socio-cognitive deficits suggests that they might be less inclined than TD children to attempt to explain actions in terms of intentions. Furthermore, the DLD group's linguistic difficulties may also contribute to them making fewer attempts at producing intentional mode explanations, and using a more limited range of constructions, than the TD group.

Methods

Participants

Two groups of 5- to 7-year-old children participated in the study. The DLD group comprised 30 children with DLD attending language units (a special educational setting – see later in this section for further details) and the TD group comprised 30 children with typical language development attending a mainstream school. The groups were matched on the mean (6 years 3 months) and standard deviation (8.6 months) of their chronological ages, and were very similar with respect to age range (DLD: 5;1 to 7;10 and TD: 5;5 to 7;10) and gender distribution (DLD: 7 girls, 23 boys and TD: 8 girls, 22 boys). All the children were monolingual English speakers. Ethical approval was obtained prior to the study from the Ethics Committee of the Department of Psychology at the University of Edinburgh and from the relevant health board ethics committee for each language unit. Informed parental consent was also obtained. All the children in this study were participating in a larger scale project (Donaldson et al., 2007).

The children in the DLD group were selected by the second author, an experienced speech and language therapist, in consultation with staff at 10 different language units in Scotland. The staff were asked to nominate children whose primary difficulties were regarded as linguistic and not to include those for whom general learning difficulties or autistic

spectrum disorders were suspected. The case notes for the selected participants indicate that 19 children had difficulties primarily with language structure, five had difficulties primarily with pragmatic aspects of language and six had both structural and pragmatic difficulties. Naturalistic data collected for another part of our project was used to calculate the children's mean length of utterance (MLU). This ranged from 1.99 to 5.55 morphemes, with a mean of 2.97 and a standard deviation of 0.66. (For further details of the DLD group, see (Donaldson et al., 2007).

The TD children attended a mainstream primary school in a socially and economically disadvantaged area of a Scottish city, and were selected as being “middle achievers” on the basis of the groups to which their teacher had assigned them for classroom work. None of them had any history of receiving (or being referred for) speech and language therapy.

When we collected our data (mid 1990s), it was common for children in the UK with relatively severe and specific language impairments to receive at least some of their primary education in language units, a form of special educational setting providing intensive intervention, delivered by teachers and speech and language therapists. In selecting our DLD group, we did not apply narrow criteria such as requiring participants to have a minimum non-verbal IQ level or a discrepancy between non-verbal and verbal IQ. This was because we wanted our participants to be broadly typical of the population of children in language units at that time, since we envisaged that they were the most likely target group for our proposed resource materials. Subsequent trends towards children with language impairments being educated in mainstream classes rather than in language units mean that studying a broadly defined DLD group is even more relevant than previously to our goal of resource development. The way we selected our DLD participants is consistent with the approach to defining and diagnosing DLD endorsed recently by Bishop, Snowling, Thompson, Greenhalgh, and CATALISE consortium (2016).

Similarly, we prioritised comparing language unit children with chronological age peers to establish the size of the gap in ability to handle intentional mode explanations that they would have to cope with in making the transition to mainstream classes, and hence to shed light on how such transitions might be facilitated. It was because we wanted to make a realistic but conservative assessment of the size of this gap that we selected the TD group from a school in a socially and economically deprived area and from children regarded as middle achievers. As children with DLD are increasingly being educated in mainstream classes, it has become even more important to understand the nature of the difficulties that they are likely to encounter in comparison to typically developing chronological age peers. While it would have been valuable to include an additional group matched to the DLD group on language age, resource constraints precluded this.

Materials

All items were based on causally-related sequences consisting of three elements:

- an intention to achieve an outcome (e.g. a girl intending to give a boy a fright)
- an action that could plausibly contribute to achieving the intended outcome (e.g. the girl putting a spider in the boy's bed)
- an outcome of the action that involved the intention being fulfilled (e.g. the boy getting a fright).

For each item, there were two pictures, one depicting the action and the other depicting the outcome. No attempt was made to depict the intention. The pictures were colourful cartoon-style drawings, specially drawn by a graphic artist (see Figure 1 for examples). There were ten sequences of pictures and the two pictures comprising each sequence were presented on separate laminated cards (15cm x 11 cm). An extra copy was made of two of the picture sequences to facilitate them being presented twice (see Procedure), giving a total of 12

picture sequences. The action pictures were backed with green card and the outcome pictures with yellow card.

Figure 1 about here

The linguistic stimuli comprised *why* questions (e.g. *Why did the girl put a spider in the bed?*) and *what next* questions (e.g. *The girl put a spider in the bed. What happened next?*); incomplete *because* and *so* sentences (e.g. *The girl put a spider in the bed because/so...*; and complete *because* and *so* sentences (e.g. *The girl put a spider in the bed because she wanted to give the boy a fright; The girl put a spider in the bed so that the boy would get a fright*). The linguistic stimuli were combined with the pictorial stimuli to yield two sets of 24 items. The same pictures were used in the same order for both sets, but the sets differed in that the pictures that were used for *why/because* items in one set were used for *what next/so* items in the other set. Consequently, the sets also differed with respect to the presentation order of these two types of items. In set A, *why* items preceded *what next* items and *because* items preceded *so* items, whereas in set B, this order was reversed. Half the children in each group received set A and half received set B.

Procedure

Participants were tested individually in a quiet area within their school or language unit. Sessions were audio- and video-recorded for later transcription and analysis. The elicited production task was presented as a game in which the child and researcher took turns to talk about the picture-cards. The cards were divided into two piles, one for the child and one for the researcher, such that for each item one player had the action card and the other had the outcome card. At the beginning of the session, the researcher explained that whoever had the picture with the green backing (i.e. the action card) should speak first. On average, testing sessions were about 6 minutes in length.

Each child received 24 items in total. The results presented in this paper relate mainly to a

subset of 16 items designed to elicit intentional mode explanations. These consisted of:

- four *why* question items that required the children to answer the researcher's *why* questions about the action pictures (e.g. *Why did the girl put a spider in the bed?*)
- six sentence completion items where the children were asked to complete three *because* sentences and three *so* sentences in response to the researcher producing the first clause (which described the action picture) and causal connective (e.g. *The girl put a spider in the bed because...*)
- two imitation items that required the children to imitate complete intentional mode sentences produced by the researcher, one involving a *because* construction and one a *so* construction (e.g. *The girl blew her whistle so her dog would come.*)
- four full sentence items in which the children were encouraged to produce complete intentional mode sentences by themselves, two involving *because* constructions and two *so* constructions.

In addition to this core subset of 16 items, the children received four *what next* question items (e.g. *The girl put a spider in the bed. What happened next?*), which were designed to elicit descriptions of the outcome pictures using finite verb forms, and four items that encouraged the children to ask *why* and *what next* questions about the action pictures. We will briefly report how the children responded to *what next* questions to provide a comparison with responses to *why* questions. However, we will not report the data from the asking questions items as these are not central to the aims of this paper and were included mainly to contribute to the turn-taking scenario.

Although the task was designed primarily to assess children's production, it should be noted that all the item types except production of full sentences also make demands on the children's receptive language abilities. To answer *why* and *what next* questions appropriately, children need to understand the question words as well as the syntax of the questions. For

sentence completion items, children need to comprehend the meaning of the causal connective and of the first clause in order to produce an appropriate final clause. And for imitation items, while it would be possible to repeat the sentence verbatim without understanding it, children need to carry out some form of receptive processing of the stimulus sentence before they can repeat it.

For the children who received item set A, the presentation order was as follows:

- i. Answer four *why* questions and then ask two *why* questions
- ii. Answer four *what next* questions and then ask two *what next* questions
- iii. Complete two *because* sentences, imitate a *because* sentence, complete another *because* sentence and then produce two full *because* sentences.
- iv. Complete two *so* sentences, imitate a *so* sentence, complete another *so* sentence and then produce two full *so* sentences.

For the children who received item set B, the order of (i) and (ii) was reversed, as was the order of (iii) and (iv). The picture-cards used for the first item where the child was encouraged to ask a *why* or *what next* question or to produce a complete *because* or *so* sentence were duplicates of those used in the immediately preceding item, to help cue the child in to the type of construction that was expected. For both item sets, the picture-cards used for sections (i) and (ii) were used again for sections (iii) and (iv). An outline of the script for a complete testing session is provided in the Appendix.

Coding

Three main dimensions of coding were applied: overall response type, acceptability and construction type.

Overall response type

Responses to all items were coded for overall response type, with the main distinction being whether responses were or were not in the intentional mode. Responses were coded as

intentional if they used a recognisable version of one of the constructions characteristic of the intentional mode to refer to the agent's intention to carry out an action or to achieve an outcome (see Table 1 for examples). Responses that were not coded as *intentional* were sub-categorised as:

- *para-intentional* if they implied an intended action or anticipated outcome but did not contain a verb that referred explicitly to this, e.g. *He put money in the chocolate machine because...he wanted some chocolate*
- *empirical* if they used a finite verb form to express a causal relationship between an action and an event/state, e.g. *Why did the girl blow her whistle? Because her Mum said "blow"*
- *bare* if the verb referring to the outcome of an action occurred in its bare stem (i.e. non-finite) form, e.g. *The girl threw the ball because... she **knock** down the coconuts*
- *partial* if they were responses to imitation or full sentence items that consisted of just a single clause or question
- *other* if they were too ambiguous or incomplete to be assigned to any of the above categories
- *null* if the child did not respond, responded with "don't know", or required extensive prompting.

Acceptability

Responses that were assigned to the intentional, para-intentional or empirical categories were categorised as either correct responses or errors. To be coded as correct, a response needed to be both semantically appropriate and structurally well-formed in relation to the particular mode of explanation to which it had been assigned. Responses were coded as correct even if they included minor structural errors so long as these did not either relate to the core structural characteristics of the relevant type of explanation or significantly affect the

clarity of the response such that it was difficult to determine the meaning the child was trying to convey. For example, missing determiners or incorrect uses of pronouns were generally not coded as errors. Errors could be of various types, including: inversions, where the direction of the causal relation between the reason/cause and the outcome/effect was reversed (e.g. *Why did the girl put a spider in the bed? Because the boy got a fright.*); semantic errors, where the response was semantically inappropriate (e.g. implausible, confused, vague or tautological); and structural errors, such as omitting the infinitive particle *to* (e.g. *Because she wanted scare her brother.*) or not using the appropriate tense/finiteness markers (e.g. *Because she want to scare her brother.*). In cases where the child used a different causal connective from the one used by the researcher (on sentence completion, imitation and full sentence items), the response was coded in relation to the child's connective and therefore was treated as an error only if the second clause was inconsistent with the child's connective (e.g. *The girl put a spider in the bed so...because the boy would get a fright.*).

Construction type

Intentional responses were coded according to the type of construction they used to express intentionality: (a) *want to* + verb stem, (b) *going to* + verb stem, (c) *will/would* + verb stem, (d) *can/could* + verb stem, (e) infinitive (*to* + verb stem), (f) other constructions. In addition, intentional responses were coded as causally marked if they included a causal connective or as unmarked if they did not. Marked responses were sub-categorised according to the causal connective used (*because*, *so (that)*, *to*, or other).

Reliability of coding

All responses were coded by the first author and by two student research assistants. The assistants were trained to apply the coding system to the data for 6 randomly selected participants from each group. The remainder of the data (80%) was coded by all three coders, and disagreements were resolved through discussion. Inter-rater agreement was calculated on

the 16 core items for the categories most relevant to the main findings, across all three raters and for each pair of raters. Regarding whether responses were attempts at producing intentional mode explanations or not, agreement was 88% across all three raters and ranged from 89% to 94% for pairwise calculations. Within those responses that were coded as intentional (after resolving disagreements), agreement regarding whether or not they were correct was 82% across all three raters and ranged from 87% to 89% across pairs. For construction type ratings (of those responses where all/both coders had coded the response as intentional), agreement was 96% across all three raters and ranged from 96% to 97% across pairs.

Results

Statistical analysis strategy

In analysing the data reported in this section, we have used two main types of statistical tests – chi squares and *t*-tests. We have used chi squares to address questions about whether there are significant differences in the **relative** frequencies of two or more categories of response. We have used *t*-tests to address questions about whether the **absolute** frequencies of responses in a single category differ significantly between the DLD and TD groups.

Ability to distinguish between why and what next questions

The task used here was designed primarily to assess children's ability to explain actions in terms of an agent's intention to achieve a particular outcome. This required them to use a non-finite verb form to refer to the outcome within an intentional mode construction to signal that they were talking about an **intended** outcome rather than reporting what had actually happened. To investigate whether the children were able to make a contrast between describing the outcome as intended and as actual, our task also included *what next* questions that were designed to elicit reports of what had actually happened (i.e. empirical mode responses referring to the outcome with finite verbs). The TD group's responses indicated

that they were able to make this contrast in their production (which in turn implies that they understood the two types of question). A clear majority (72%) of the TD group's responses to *why* questions were correct intentional or para-intentional responses and a clear majority (78%) of their responses to *what next* questions were correct empirical responses. For the DLD group, the majority of responses to both item types were incorrect (errors or null responses): 72% for *why* and 61% for *what next*. This suggests that they had difficulties in processing/understanding the questions, or in producing appropriate responses, or both. Nevertheless, the DLD group did appear to be treating the two question types differently, in that they made more attempts at producing intentional/para-intentional responses for *why* than for *what next* items (43% versus 18%, $\chi^2(1) = 17.58, p < .001$) but more attempts at producing empirical responses for *what next* than for *why* items (54% versus 32%, $\chi^2(1) = 12.40, p < .001$). Since our primary concern is children's ability to produce intentional mode explanations, subsequent analyses will not include responses to *what next* questions and will be based on the 16 "core" items designed to elicit intentional mode explanations.

Did the DLD group produce fewer correct intentional mode explanations and fewer attempts at producing intentional mode explanations than the TD group?

Table 3 shows the mean number of correct and incorrect attempts at producing intentional mode explanations, collapsed across all core items. Two one-tailed independent *t*-tests were carried out to investigate the effect of group (DLD versus TD) on the number of correct intentional mode explanations and on the total number of attempts at producing intentional mode explanations. Not only did the DLD group produce significantly fewer correct intentional explanations than the TD group ($t(58) = 6.59, p < .001$; DLD group, $M = 2.93$, $SD = 2.91$; TD group, $M = 8.50$, $SD = 3.60$) but they also made significantly fewer attempts at producing intentional explanations ($t(58) = 4.82, p < .001$; DLD group, $M = 4.97$, $SD = 4.26$; TD group, $M = 9.77$, $SD = 3.41$). The lower frequency of correct intentional

explanations for the DLD group is not simply a by-product of them producing fewer attempts at intentional explanations than the TD group, since the frequency of errors (relative to intentional attempts) was significantly higher for the DLD group (41%) than for the TD group (13%), $\chi^2(1) = 44.46, p < .001$.

Table 3 about here

A possible reason for the DLD group producing fewer intentional attempts than the TD group might be their linguistic difficulties leading them to produce para-intentional or bare responses, which are typically less linguistically complex. As can be seen from Table 4, para-intentional responses (e.g. *Because he was wanting ice-cream* – in response to *Why did the boy get some money?*) were actually slightly more frequent for the TD (9%) than for the DLD group (8%). On the other hand, bare responses (e.g. *Get a fish* – in response to *Why did she put a worm on her fishing rod?*) were more frequent for the DLD (15%) than for the TD group (3%). To take account of the possibility that at least some of the bare responses may have been attempts to produce intentional explanations, each participant was given a score based on the sum of their intentional, para-intentional and bare responses. A further one-tailed independent *t*-test was conducted on these “potential intentional attempt” scores. Even with this more lenient interpretation of intentional attempts, the DLD group still made significantly fewer attempts at producing intentional mode explanations than the TD group ($t(58) = 3.50, p < .001$; DLD group, $M = 8.67, SD = 4.01$; TD group, $M = 11.70, SD = 2.54$).

Table 4 about here

Table 4 shows how each group’s responses were distributed across the overall response types and between the correct and error categories. In addition to the errors in the intentional, para-intentional and empirical categories, responses in the bare, partial, other and null categories can also be regarded as incorrect. While all types of correct and incorrect responses were produced by both groups, the DLD group produced each type of incorrect

response more frequently and each type of correct response less frequently than the TD group. Overall, the DLD group produced incorrect responses more frequently than correct responses (69% versus 31%) whereas the TD group showed the opposite pattern (23% incorrect versus 77% correct).

Although the DLD group scored significantly below the TD group on the measures of overall performance considered so far, they did demonstrate some ability to produce intentional mode explanations. Inspection of individual response profiles showed that out of the 30 children in the DLD group, 26 attempted to produce an intentional explanation on at least one item, 28 did so if para-intentional explanations were included, and all 30 of them did so if bare responses were also included. Furthermore, within the DLD group's intentional attempts, correct responses were significantly more frequent than errors (59% versus 41%, $\chi^2(1) = 4.89, p < .05$). On imitation and full sentence items, although the DLD group produced more partial responses (e.g. *For her dog to come* – in response to the imitation item *The girl blew her whistle so her dog would come*) than the TD group, two clause responses were considerably more frequent than partial responses even for the DLD group (75% versus 25%) and the majority of these (55%) were intentional/para-intentional (compared to 80% for the TD group).

Did the DLD and TD groups differ in the linguistic constructions they used when producing intentional mode explanations?

Table 5 shows how each group's attempts at producing intentional mode explanations were distributed across the three main types of linguistic construction. A 3x2 chi square test (excluding the small number of "other" responses) showed that there was a significant association between construction type frequency and group ($\chi^2(2) = 14.58, p < .01$).

To explore the nature of this association, three 2x2 chi square tests were carried out (with Bonferroni corrections for multiple comparisons). These indicated that the significant

association between construction type frequency and group was attributable to the DLD group being proportionately less likely than the TD group to use *would/could* constructions (DLD 9%, TD 24%), compared to their use of *want/go* (DLD 47%, TD 34%, $\chi^2(1) = 14.62, p < .01$) and infinitive constructions (DLD, 42%; TD, 41%, $\chi^2(1) = 8.24, p < .05$).

To further explore patterns of construction frequency, one-sample chi square tests were conducted on each pair of constructions within each group (i.e. six tests in total, again with Bonferroni corrections). Both groups used infinitives significantly more than *would/could* constructions (DLD, 42% versus 9%, $\chi^2(1) = 30.32, p < .001$; TD, 41% versus 24%, $\chi^2(1) = 13.76, p < .01$). The DLD group also used *want/go* constructions significantly more than *would/could* constructions (47% versus 9%, $\chi^2(1) = 37.33, p < .001$), whereas for the TD group, the frequencies of these constructions did not differ significantly once the Bonferroni correction was applied (34% versus 24%, $\chi^2(1) = 6.02$). Neither group showed a significant difference in frequency of use between infinitive and *want/go* constructions.

Table 5 about here

A similar pattern emerges regarding the range of intentional mode constructions included in each individual child's profile across all items. In the TD group, most children (22/30 = 73%) used all three construction types and the remaining children used two construction types. In the DLD group, most children used either one construction type (12/30 = 40%, with five using infinitives and seven *want/go*) or two construction types (11/30 = 37%), and only three children (10%) used all three construction types.

It is striking that, for the DLD group as well as the TD group, the vast majority of attempts at producing intentional mode explanations included explicit causal markers (e.g. *because, so, to*). Overall, 79% of the DLD group's and 81% of the TD group's intentional mode responses were causally marked.

Discussion

Overview of findings

The findings from the current study contribute to knowledge regarding how children with developmental language disorder produce explanations and causal sentences by showing that they have difficulties not only in explaining events (Donaldson et al., 2007), but also in explaining actions in terms of intentions. Compared to their typically developing chronological age peers, the children with DLD produced fewer correct intentional mode explanations, used a more restricted range of construction types, and made fewer attempts at producing intentional mode explanations. These findings add to the growing body of evidence that school-age children with DLD face challenges in producing complex sentences. Causal sentences involving the modal verbs *would* or *could* appear to be particularly challenging. On a more positive note, our findings are consistent with previous evidence that children with DLD are relatively good at using *want to* constructions and they extend previous evidence by showing that this applies not only to the two-clause sentences used in previous studies but also to three-clause sentences. Furthermore, we found that 5- to 7-year-olds with DLD have some ability to produce infinitive clauses that modify the main clause directly, although the fairly frequent occurrence of bare responses suggests that the “to” particle is sometimes being omitted.

Exploring the nature of the DLD group’s difficulties

This study focused mainly on identifying the nature of the linguistic difficulties that children with DLD may encounter when producing explanations of actions in terms of intentions. However, the findings also provide some interesting hints regarding the complexity of the interplay between linguistic and socio-cognitive factors and illustrate some of the challenges entailed in teasing out their relative contributions.

At first sight, the finding that the DLD group was less likely than the TD group to attempt to produce intentional mode explanations may seem to imply a socio-cognitive deficit. It is possible, though, that some of the DLD group's intentional mode attempts went unrecognised due to linguistic limitations. When we investigated this possibility by defining a broader category of potentially intentional attempts (i.e. para-intentional and bare responses as well as intentional responses), the difference between groups remained significant. However, there are also other ways in which linguistic difficulties could have impacted on the DLD group's production of intentional attempts. In those instances where intentional attempts were not produced, the DLD group produced more incorrect than correct responses, whereas the TD group produced more correct than incorrect responses. It was not only intentional mode errors that were more frequent for the DLD than the TD group but also other types of incorrect responses including empirical mode errors and partial responses. Thus, for example, if a child responded to "the girl blew her whistle because..." with "the dog came", this was coded as an empirical error. Such errors might reflect either linguistic difficulties (e.g. not knowing that *because* should introduce a description of a cause/reason) or socio-cognitive difficulties (e.g. a focus on actual events rather than on mental representations of events) or a combination of both. Similarly, partial responses to imitation and full sentence items may reflect either linguistic difficulties (e.g. in coordinating the production of more than one clause) or socio-cognitive difficulties (e.g. in representing or reasoning about relations between actions and intentions). Furthermore, although our study's primary focus was on assessing production, some of the TD group's linguistic difficulties may involve difficulties with comprehension rather than (or in addition to) difficulties with production.

Although *would/could* constructions were the least frequent type of intentional mode construction for both groups, these constructions were relatively less frequent and *want/going*

to constructions were relatively more frequent for the DLD group than for the TD group.

There are a number of possible interpretations for this finding. One possibility is that children with DLD may find *so...would/could* constructions more difficult linguistically than the other types of intentional mode constructions. Alternatively, since the different linguistic constructions highlight different elements of a fully specified intentional mode explanation, the reason for children with DLD having difficulties with *would/could* constructions might be because they emphasise the predicted outcome and hence allude to the agent's belief that the action will cause the outcome. This would be consistent with previous evidence that the ability to reason about desires develops in advance of the ability to reason about beliefs.

Limitations and future research directions

Although our findings raise interesting issues regarding the potential contributions of linguistic and socio-cognitive factors to difficulties in producing explanations of actions, this study was not designed to distinguish between these two sources of difficulty and it focused primarily on assessing linguistic skills. In a subsequent publication, we intend to explore further the interplay between linguistic and socio-cognitive aspects of the ability to explain actions, by reporting how the same groups of participants performed on a less verbally demanding task that investigated their reasoning about actions and intentions. An important next step in future studies will be to incorporate additional control groups (e.g. matched to the DLD group on language age or on socio-cognitive abilities) to address more directly questions about the extent to which linguistic and socio-cognitive skills make distinct contributions or interact when children are explaining actions.

Because of the socio-cognitive demands associated with intentional mode explanations, it would also be interesting to compare sub-groups of children with DLD to investigate whether those with pragmatic difficulties find intentional mode explanations even more challenging than do other children with DLD. Although this study was not designed to

address this question, we carried out an exploratory analysis to compare those children whose case notes indicated that they had pragmatic difficulties (N=11) to the other children with DLD (N=19). This comparison provides a hint that children with pragmatic difficulties may be slightly less likely to attempt to produce intentional mode explanations (25% of their total responses) than children with other types of DLD (35%), but that the intentional mode explanations produced by children with pragmatic difficulties may be slightly more likely to be correct (66% versus 56%). These patterns, though, seem to be attributable more to the children who have both pragmatic and structural difficulties (N=6, 19% of responses are intentional, and 72% of these are correct) than to those whose difficulties are primarily pragmatic (N=5, 33% of responses are intentional, and 62% of these are correct). Of course, these comments are speculative, given the small size of the subgroups and the lack of standardised measures of pragmatic abilities. Nevertheless, they suggest that it would be fruitful for future research to assess systematically how pragmatic and structural abilities contribute to children's production of intentional mode explanations.

The children with DLD who participated in this study were more severely impaired than those in some previous studies of complex sentence production. For example, the children with DLD in this study were similar in age to those in Owen et al.'s (2011) study but their MLUs were lower (2.97 morphemes versus 4.95 words) and had a wider range (1.99 to 5.55 morphemes versus 4.13 to 5.78 words). Therefore, there is a need for caution in generalizing from the current findings to all children with DLD. Further research is required to establish whether children with less severe forms of DLD have fewer difficulties in producing intentional mode explanations. Nevertheless, it is noteworthy that even though our DLD group had relatively severe language difficulties, they showed at least some motivation and rudimentary ability to explain actions in terms of intentions.

Similarly, it is important not to assume that our conclusions about children with DLD's difficulties in producing intentional mode explanations in the structured task used in this study will necessarily generalize to all contexts. Although the goal of maintaining children's interest and attention was salient for us when constructing and administering the task protocol, it is nevertheless likely that the children, especially the DLD group, found it linguistically and cognitively demanding. We plan to analyse naturalistic data of classroom interactions involving the same children with DLD, in order to provide a broader picture of their ability to produce and comprehend explanations. It should be borne in mind, though, that the structured task used in the present study probably shares many features with tasks that children with DLD are likely to encounter, particularly if they are in mainstream classrooms or if their language skills are assessed in standardised tests.

Conversely, the turn-taking nature of the task arguably could have overestimated children's ability to produce intentional mode explanations, in that the experimenter's responses may have "scaffolded" the children's responses. While it is important to be aware of the possible influence of contextual factors on children's performance, it is equally important to recognise that children encounter a variety of contexts in everyday life and that the ability to handle intentional mode explanations is multifaceted. Therefore, rather than asking whether a particular task may be under-estimating or over-estimating children's abilities, it is likely to be more meaningful to consider how different tasks (or items) vary in terms of the extent and nature of the challenges they present and the support they provide. Similarly, the nature and ordering of the items used in our task were deliberately designed to vary the amount (and type) of scaffolding provided. For example, *why* question items always preceded sentence completion items because we were interested both in which linguistic constructions children would choose to use in the relatively open-ended *why* items and in whether they could produce constructions appropriate to *because* and *so* sentences when

prompted to do so in sentence completion items. Furthermore, since we expected that full sentence items would be particularly demanding, we deliberately provided some scaffolding in that the content for the first of these items was the same as for the immediately preceding sentence completion item, but we also included a second full sentence item that involved different content and so required children to produce a full sentence with less support from the experimenter. In designing the task in this way, we were aiming to strike a balance between giving children in the DLD group a variety of opportunities to demonstrate their abilities, while also allowing scope for capturing differences between the groups. An interesting avenue for future research would be to investigate more fully how these sorts of contextual variations impact on the ability to handle intentional mode explanations, in terms of differences both between DLD and TD groups and within each population.

Implications for practice

Our findings indicate that 5- to 7-year-old children with DLD can have marked and extensive difficulties with producing explanations of actions in terms of intentions. The central role of explanations, as outlined in the Introduction, implies that this area deserves specific attention within early primary education. Moreover, use of complex (and combined) syntax, causal connectives, modal verbs and cognitive state verbs are all areas which we know may present difficulties for children with DLD. There is therefore potential for useful generalisation of language learning beyond the context of explanations.

The finding that children with DLD made fewer attempts than TD children at producing intentional mode explanations suggests that children with DLD could potentially benefit from being prompted to produce these explanations in everyday classroom contexts. Since explanations of actions occur in a wide range of classroom contexts, a valuable direction for future research would be to evaluate the effectiveness of interventions that embed supportive prompts requesting explanations of actions into classroom interactions. This type of

intervention could potentially enhance the communication support available to all children, as recommended by Lindsay, Dockrell, Law and Roulstone (2012) based on the findings of the UK Government commissioned Better Communication Research Programme (BCRP). Indeed, in a further BCRP publication (Dockrell, Bakopoulou, Law, Spencer, & Lindsay, 2012), it is reported that adults in infant and early primary classrooms make infrequent use of some of the interactive techniques that support language learning, including the use of modelling techniques such as oral scripting, encouragement of turn-taking and provision of clear language choices – all techniques that are likely to be essential for facilitating children's ability to produce and understand explanations.

Although the design of this study does not enable a definitive teasing out of linguistic and socio-cognitive factors, the findings do contain hints that the DLD group's difficulties in explaining actions in terms of intentions might not be purely linguistic. And even if the difficulties do have linguistic origins, the complex interplay between linguistic and socio-cognitive abilities in this area means that there will almost certainly be an impact on socio-cognitive development also. It seems likely, therefore, that it will be beneficial for interventions to target socio-cognitive as well as linguistic abilities, although the effectiveness of such interventions would of course need to be evaluated in future research. This approach has the potential to make interventions more meaningful and enjoyable, and perhaps also to help elucidate the interface between linguistic and socio-cognitive skills. Similarly, the design of our study does not enable us to establish the extent to which receptive difficulties of children in the DLD group contribute to their performance on our task so within linguistic skills, it may well be important for interventions to target comprehension as well as production of causal constructions.

Finally, on a positive note, the findings reported herein show that 5- to 7-year-old children with DLD do have some ability to explain actions in terms of intentions. Most

children in the DLD group made some attempt to produce intentional mode explanations, these attempts were more likely to be well-formed than errors, the causal links between actions and intentions were usually explicitly marked with causal connectives, and attempts at producing intentional/para-intentional constructions were more frequent in response to *why* than to *what next* questions. Thus, there is a foundation on which intervention can build. We are currently developing communication support resources motivated by our findings. These will provide principled guidance, techniques and approaches for incorporation into everyday classroom practice, as well as into targeted small group or individualised programmes for children with identified oral language needs. We plan to collaborate with teachers and speech and language therapists in piloting and assessing the effectiveness of these resources.

Appendix: Outline of script for administration of Set A items

Key

R = Researcher

C = Child

Italics = direct speech

(...) = target response

[...] = description of picture

[...+...] = description of pictures presented on left + on right of picture-strip

Detailed presentation format and pictures are described only for the first item of each type.

Setting

C and R sit side-by-side on the floor, each with a pile of face-down picture cards in front of them. As each item is completed, the cards are placed face down into two piles of used cards.

Introduction

R: *We're going to play a game with these cards. These are your cards* (points to pile of cards that are face-down in front of child) *and these are mine* (points to pile of cards that are face-down in front of researcher). *Green* (points to green backing on researcher's top card) *means that person goes first. I've got green so I start.*

Answering *why* questions

1. R: Turns over picture [girl putting worm on fishing rod]. *Why did she put a worm on her fishing rod? You have a look at your card and see if you can answer - Why did she put a worm on her fishing rod?*

C: Turns over picture-strip [girl catching fish] *(To catch a fish. / Because she wanted to catch a fish. / So that she would catch a fish).*
2. *Why did he throw the ball? (To win a coconut. / Because he wanted to win a coconut. / So that she would win a coconut).*

3. *Why did he take out his pencil? (To draw. / Because he wanted to draw. / So that he could draw).*

4. *Why did the girl put a spider in the bed? (To give the boy a fright. / Because she wanted to give the boy a fright. / So that the boy would get a fright).*

Asking *why* questions

5. R: *Look, you've got a green card. Your turn. See if you can ask me the question.*

C: Turns over picture [girl putting spider in bed]. *(Why did the girl put a spider in the bed?)*

R: Turns over picture [boy getting a fright]. *To give the boy a fright. / Because she wanted to give the boy a fright. / So that the boy would get a fright.*

6. C: *(Why did the girl climb onto the chair?)*

R: *(To get a biscuit. / Because she wanted to get a biscuit. / So that she could get a biscuit.)*

Answering *what next* questions

7. R: Turns over picture [boy putting money in chocolate vending machine]. *He put money in the chocolate machine. What happened next?*

C: Turns over picture [boy holding bar of chocolate]. *(He got chocolate).*

8. *The boy bought some flowers. What happened next? (He gave them to his Gran in hospital).*

9. *The girl blew her whistle. What happened next? (Her dog came.)*

10. *The boy got some money. What happened next? (He bought an ice-cream.)*

Asking *what next* questions

11. R: *Look, you've got a green card. Your turn. See if you can ask me the question.*

C: Turns over picture [woman giving boy money from her purse]. *(The boy got some money. What happened next?)*

R: Turns over picture [boy buying ice-cream from ice-cream van]. (*He bought an ice-cream.*)

12. C: (*The boy jumped in a puddle. What happened next?*)

R: (*His friend got soaking wet.*)

Completion of *because* sentences

R: Turns over the two piles of used cards so that the cards that were used for item 1 appear face-up on the top of the piles. *We're going to look at these cards again. This time, I'll start and you finish.*

13. R: Picture: [girl putting worm on fishing rod]. *She put a worm on her fishing rod because...*

C: Picture: [girl catching fish]. (*... she wanted to catch a fish.*)

14. He threw the ball because... (*... he wanted to win a coconut.*)

Imitation of *because* sentence

15. R: *I want you to be a copycat and say it all after me.* Picture: [Boy taking pencil out of drawer]. *He took out his pencil because he wanted to draw.*

C: Picture: [boy drawing a picture]. (*He took out his pencil because he wanted to draw.*)

If C is hesitant in responding, R says the first couple of words of the target sentence.

Completion of *because* sentence

R: *I'll start and you finish.*

16. *The girl put a spider in the bed because... (... she wanted to give her brother a fright.)*

Production of full *because* sentences

17. R: *Now, it's your turn to do the whole thing on your own.* Picture: [boy getting a fright].

C: Picture: [girl putting spider in bed]. (*The girl put a spider in the bed because she wanted to give her brother a fright.*)

If C is hesitant in responding, R points to C's picture card and says the first couple of words of the target sentence.

18. (*The girl climbed onto the chair because she wanted to get a biscuit.*)

Completion of *so* sentences

19. R: *This time, I'll start and you finish.* Picture: [boy putting money in chocolate vending machine]. *He put money in the chocolate machine so...*

C: Picture: [boy holding bar of chocolate]. (*...he got chocolate.*)

20. *The boy bought some flowers so... (...he could give them to his Gran in hospital.)*

Imitation of *so* sentence

21. R: *I want you to be a copycat and say it all after me.* Picture: [dog coming to girl]. *The girl blew her whistle so her dog would come.*

C: Picture: [girl blowing whistle]. (*The girl blew her whistle so her dog would come.*)

If C is hesitant in responding, R says the first couple of words of the target sentence.

Completion of *so* sentence

R: *I'll start and you finish.*

22. *The boy got some money so... (... he could buy an ice-cream.)*

Production of full *so* sentences

23. R: *Now, it's your turn to do the whole thing on your own.* Picture: [woman giving boy money from her purse].

C: Picture: [boy buying ice-cream from ice-cream van]. (*The boy got some money so...he could buy an ice-cream.*)

If C is hesitant in responding, R points to C's picture card and says the first couple of words of the target sentence.

24. (*The boy jumped in a puddle so that his friend would get wet.*)

For Set B items, the order of presentation of the pictures was the same as in Set A, but the *why* and *because* items were interchanged with the *what next* and *so* items. For example, in Set B, item 1 became *She put a worm on her fishing rod. What happened next?* and item 19 became *He put money in the chocolate machine because... (...he wanted to get chocolate).*

Table 1. Three ways of constructing intentional mode explanations.

Construction type	Examples	Emphasises	Linguistic structure
<i>Because + want/going to</i>	<p><i>The girl put a spider in the bed because she wanted to give the boy a fright.</i></p> <p><i>The boy got some money because he was going to buy an ice-cream.</i></p>	Agent's desire	<ul style="list-style-type: none"> two clauses linked by subordinating connective <i>because</i> the clause introduced by <i>because</i> contains a cognitive state verb (<i>want/go to</i>) that refers to the agent's desire or goal cognitive state verb subsumes a non-finite complement clause which specifies the content of the desire or goal

<p><i>So (that) + would/could</i></p>	<p><i>The girl put a spider in the bed so (that) the boy would get a fright.</i></p> <p><i>The boy got some money so (that) he could buy an ice-cream.</i></p>	<p>Predicted outcome and hence agent's belief that the action will cause the outcome</p>	<ul style="list-style-type: none"> • two clauses linked by subordinating connective <i>so (that)</i> • the clause introduced by <i>so (that)</i> contains a modal auxiliary verb form (<i>would/could</i>) that refers to the anticipated outcome
<p>Infinitive, i.e. <i>To + verb</i></p>	<p><i>The girl put a spider in the bed to give the boy a fright.</i></p> <p><i>The boy got some money to buy an ice-cream.</i></p>	<p>Purposeful nature of agent's action</p>	<ul style="list-style-type: none"> • a main clause followed by an infinitival complement (<i>to...</i>) • the infinitival complement functions as an adverbial clause of reason and directly modifies the main clause

Table 2. How *because* and *so* constructions differ between the intentional and empirical modes.

Use of <i>because</i> : Intentional Mode Explanation	
Structure:	ACTION --- <i>because</i> --- REASON (= intention to achieve outcome, focusing on desire/goal)
Example:	<i>The girl put a spider in the bed <i>because</i> she wanted to give the boy a fright.</i>
Note:	<i>because</i> introduces answer to <i>why</i> question in sense of “for what purpose?”
Use of <i>because</i> : Empirical Mode Explanation	
Structure:	OUTCOME/EFFECT --- <i>because</i> --- REASON/CAUSE
Example:	<i>The boy got a fright <i>because</i> the girl put a spider in the bed.</i>
Note:	<i>because</i> introduces answer to <i>why</i> question in sense of “what happened to cause?”
Use of <i>so (that)</i> : Intentional Mode Explanation	
Structure:	ACTION --- <i>so (that)</i> --- REASON (= intention to achieve outcome, focusing on expected outcome)
Example:	<i>The girl put a spider in the bed <i>so (that)</i> the boy would get a fright.</i>
Note:	<i>so (that)</i> introduces answer to <i>why</i> question in sense of “for what purpose?” <i>so (that)</i> is used in sense of “in order that”
Use of <i>so</i> : Empirical Mode Explanation	
Structure:	REASON/CAUSE --- <i>so</i> --- OUTCOME/EFFECT
Example:	<i>The girl put a spider in the bed <i>so</i> the boy got a fright.</i>
Note:	<i>so</i> introduces answer to <i>what happened as a result of</i> question <i>so</i> is used in sense of “therefore”

Table 3. Means (and standard deviations) by group for correct, incorrect and total attempts at producing intentional mode responses (across all core item types). Maximum possible score per cell = 16.

Intentional mode responses	DLD Group	TD Group
correct	2.93 (2.91)	8.50 (3.60)
error	2.03 (2.24)	1.27 (1.23)
total attempts	4.97 (4.26)	9.77 (3.41)

DLD: developmental language disorder; TD: typically developing

Table 4. Distribution of each group's responses across overall response types as percentages of total responses per group.[†]

	DLD Group	TD Group
Response type		
Intentional	31% (149)	61% (293)
correct	18% (88)	53% (255)
errors	13% (61)	8% (38)
Para-intentional	8% (40)	9% (44)
correct	3% (12)	7% (33)
errors	6% (28)	2% (11)
Empirical	27% (128)	24% (117)
correct	10% (47)	17% (80)
errors	17% (81)	8% (37)
Bare	15% (71)	3% (14)
Partial	9% (42)	1% (4)
Other	6% (27)	1% (3)
Null	5% (23)	1% (5)
Total correct	31% (147)	77% (368)
Total incorrect	69% (333)	23% (112)

[†] Total responses per group = 480 (including null responses)

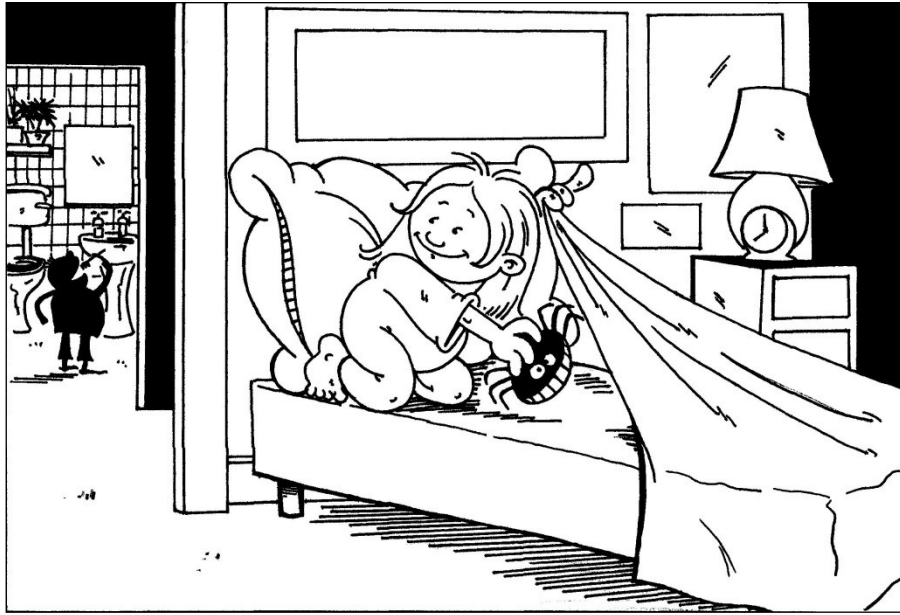
DLD: developmental language disorder; TD: typically developing

Table 5. Linguistic constructions used by each group when attempting to produce intentional mode explanations, as percentages of intentional responses per group (and as frequencies).

	DLD group	TD group
Infinitive	42% (62)	41% (120)
<i>Why</i> items	9% (14)	18% (53)
<i>Because</i> items	15% (22)	14% (40)
<i>So</i> items	17% (26)	9% (27)
<i>Want/go</i>	47% (70)	34% (101)
<i>Why</i> items	11% (16)	5% (16)
<i>Because</i> items	30% (44)	27% (78)
<i>So</i> items	7% (10)	2% (7)
<i>Would/could</i>	9% (14)	24% (69)
<i>Why</i> items	3% (4)	3% (9)
<i>Because</i> items	2% (3)	3% (9)
<i>So</i> items	5% (7)	17% (51)
Other	2% (3)	1% (3)
Total	100% (149)	100% (293)

DLD: developmental language disorder; TD: typically developing

Figure 1. Sample picture stimuli.



ACTION: the girl put a spider in the bed



OUTCOME: the boy got a fright

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